Whereas I claim:

1. A device to convert energy by displacing fluid, the device comprising:

an outer rotor adapted to rotate about a first axis of rotation and comprising:

a plurality of fins each comprising a first surface and a second surface that partially define a chamber region interposed thereinbetween where a first fin and a second fin are members of the said plurality of fins and are adjacent to each other, and

a first reference radius extends through the first fin and a second reference radius extends through the second fin, a first surface of the said first fin is a first defined distance from the said first reference radius with respects to the radial location along the said first reference radius, and a second surface of the said second fin is a second defined distance from the said second reference radius with respects to the radial location along the said second reference radius, and

the number of the chambers indicated by variable X,

an outer reference dimension circle that is concentric with the said first axis of rotation of the said outer rotor and the outer reference dimension circle having a radius r_o;

a plurality of inner rotors each adapted to rotate about a second set of axes of rotation and each inner rotor

comprising an inner reference circle that is concentric with the axis of rotation of each inner rotor and each inner reference circle intersecting the outer reference circle of the said outer rotor at an intersect point where the velocity of the inner rotor and outer rotor are the same at the said intersect points, the inner reference circles each having a radius r_i, the inner rotors further each comprising a plurality of legs the number of said legs for each inner rotor is indicated by variable □ where a first leg that is a member of said legs comprises a foot region the foot region comprising;

a heel region comprising a first reference point that is adapted to rotate with said first reference circle where said first reference point is non constant perpendicular distance from the said first reference radius of the outer reference circle with respects to rotation of the inner and the outer rotor, and the heel region further comprising a first engagement surface that is a first defined distance from the said first point where the said first defined distance of the heel region and the first defined distance of the first surface of the said first fin are collinear and their sum is non constant with respects to rotation of the inner rotor and the outer rotor,

a toe region comprising a second reference point that is positioned on said inner reference dimension circle, a second engagement surface that is a second defined distance from

the reference point where the second defined distance of the toe region and the second defined distance of the second surface of the second fin are collinear and their sum is non constant with respects to rotation of the inner rotor and outer rotor,

a casing having an inner chamber region that is adapted to house said outer rotor and allow the outer rotor to rotate therein, the casing comprising;

a fluid entrance system comprising a duct to communicate with the chamber region of the said outer rotor,

an interior cavity adapted to house the said inner rotors and allow the inner rotors to rotate therein,

whereas the said variables □ ,□, r_i ,r_o are constrained by the equation □ / □ = r_i / r_o , the foot region of the said first leg is adapted to engage the chamber region where the first engagement surface of said heel region engages the said first surface of a first fin and the said second engagement surface of the said toe region of the said first foot is adapted to engage the second surface of a second fin to form a sealed operating chamber where rotation of the said first rotor and the said rotor causes displacement of fluid in the sealed operating chamber.

2. The device as recited in claim 1 where the said porting of the casing is adapted to allow non compressible fluid to enter the said chamber region and the casing comprising a

discharge port in communication with the sealed operating chamber as the volume of fluid is displaced.

3. The device as recited in claim 1 where ratio of r_i / r_o is less than ½.

4. The device as recited in claim 1 where the casing comprises a gas expansion region and a gas inlet port that is in communication with a gas expansion chamber that is defined by first and second surfaces of two adjacent fins and the said first foot where the chamber is adapted to receive expanding gas that applies a torque to the outer rotor.

5. The device as recited in claim 4 where ratio of r_i / r_o is less than ½.

6. The device as recited in claim 1 where the casing comprises a gas entrance channel that is adapted to receive a gas and the sealed operating chamber operates as a gas compression chamber that is adapted to compress gas and be discharged through an exit channel.

7. The device as recited in claim 1 where ratio of r_i / r_o is an integer value.

8. The device as recite in claim 6 where the exit channel has an adjustment system to adjust the compression ratio of the compressed gas.

9. The device as recite in claim 6 where the gas is air.

10. The device as recited in claim 6 further having a second expansion device that comprises:

a second outer rotor adapted to rotate about a first axis of rotation and the second outer rotor comprising:

a plurality of fins each comprising a first surface and a second surface that partially define a chamber region interposed thereinbetween where a first fin and a second fin are members of the said plurality of fins and are adjacent to each other, and

a first reference radius extends through the first fin and a second reference radius extends through the second fin, a first surface of the said first fin is a first defined distance from the said first reference radius with respects to the radial location along the said first reference radius, and a second surface of the said second fin is a second defined distance from the said second reference radius with respects to the radial location along the said second reference radius, and

the number of the chambers indicated by variable X,

an outer reference dimension circle that is concentric with the said first axis of rotation of the said outer rotor and the outer reference dimension circle having a radius r_o;

a second set of plurality of inner rotors each adapted to rotate about a second set of axes of rotation and each inner rotor comprising an inner reference circle that is

concentric with the axis of rotation of each inner rotor and each inner reference circle intersecting the outer reference circle of the said outer rotor at an intersect point where the velocity of the inner rotor and outer rotor are the same at the said intersect points, the inner reference circles each having a radius r_i, the inner rotors further each comprising a plurality of legs the number of said legs for each inner rotor is indicated by variable ▯ where a first leg that is a member of said legs comprises a foot region the foot region comprising;

a heel region comprising a first reference point that is adapted to rotate with said inner reference circle where said first reference point is non constant perpendicular distance from the said first reference radius of the outer reference circle with respects to rotation of the inner and the outer rotor, and the heel region further comprising a first engagement surface that is a first defined distance from the said first point where the said first defined distance of the heel region and the first defined distance of the first surface of the said first fin are collinear and their sum is non constant with respects to rotation of the inner rotor and the outer rotor,

a toe region comprising a second reference point that is positioned on said inner reference dimension circle, a second engagement surface that is a second defined distance from the reference point where the second defined

distance of the toe region and the second defined distance of the second surface of the second fin are collinear and their sum is non constant with respects to rotation of the inner rotor and outer rotor.

11. The device as recited in claim 10 further comprising:

    a combustion chamber where air is directed from the said exit channel to an inlet region of the said combustion chamber. The combustion chamber further comprising an exit passage that is in communication with an expansion passage.

12. The device as recited in claim 11 where the exiting gas from the expansion passage is used for output thrust work.

13. The device as recited in claim 11 where the casing comprises a gas expansion region and a gas inlet port that is in communication with a gas expansion chamber that is defined by first and second surfaces of two adjacent fins and the said first foot where the chamber is adapted to receive expanding gas that applies a torque to the outer rotor.

14. The device as recited in claim 13 where the torque on the outer rotor is used to compress air to feed the said combustor.

15. The device as recited in claim 13 where a portion of the output gas from the combustor is directed to drive an expansion chamber of the said second compression device.

16. The device as recited in claim 10 where the second expansion device is comprises a shaft that is connected to

the outer rotor and the second outer rotor where the axis of rotation of the first rotor and second rotor are collinear.

17. A device to convert energy by displacing fluid, the device comprising:

an outer rotor adapted to rotate about a first axis of rotation and comprising:

a plurality of fins each comprising a first surface and a second surface that partially define a chamber region interposed thereinbetween where a first fin and a second fin are members of the said plurality of fins and are adjacent to each other, and

a first reference radius extends through the first fin and a second reference radius extends through the second fin, a first surface of the said first fin is a first defined distance from the said first reference radius with respects to the radial location along the said first reference radius, and a second surface of the said second fin is a second defined distance from the said second reference radius with respects to the radial location along the said second reference radius, and

the number of the chambers indicated by variable X,

an outer reference dimension circle that is concentric with the said first axis of rotation of the said outer rotor and the outer reference dimension circle having a radius r_o;

an inner rotor adapted to rotate about a second axis of rotation and the inner rotor comprising an inner reference circle that is concentric with the second axis of rotation and the inner reference circle intersecting the outer reference circle of the said outer rotor at an intersect point where the velocity of the inner rotor and outer rotor are the same at the said intersect points, the inner reference circle having a radius r_i, the inner rotor further comprising a plurality of legs the number of said legs for each inner rotor is indicated by variable □ where a first leg that is a member of said legs comprises a foot region the foot region comprising;

a heel region comprising a first reference point that is adapted to rotate with the inner reference circle where said first reference point is non constant perpendicular distance from the said first reference radius of the outer reference circle with respects to rotation of the inner and the outer rotor, and the heel region further comprising a first engagement surface that is a first defined distance from the said first point where the said first defined distance of the heel region and the first defined distance of the first surface of the said first fin are collinear and their sum is non constant with respects to rotation of the inner rotor and the outer rotor,

a toe region comprising a second reference point that is positioned on said inner reference dimension circle, a second engagement

surface that is a second defined distance from the reference point where the second defined distance of the toe region and the second defined distance of the second surface of the second fin are collinear and their sum is non constant with respects to rotation of the inner rotor and outer rotor,

a casing having an inner chamber region that is adapted to house said outer rotor and allow the outer rotor to rotate therein, the casing comprising;

a fluid entrance system comprising a duct to communicate with the chamber region of the said outer rotor,

an interior cavity adapted to house the said inner rotors and allow the inner rotors to rotate therein,

whereas the said variables □ ,□, r_i ,r_o are constrained by the equation □ / □ = r_i / r_o , the foot region of the said first leg is adapted to engage the chamber region where the first engagement surface of said heel region engages the said first surface of a first fin and the said second engagement surface of the said toe region of the said first foot is adapted to engage the second surface of a second fin to form a sealed operating chamber where rotation of the said first rotor and the said rotor causes displacement of fluid in the sealed operating chamber.

18. The device as recited in claim 17 where the said sealed chamber is maintained for five degrees of rotation of the inner rotor.

19. The device as recited in claim 17 where the said sealed chamber is maintained for fifteen degrees of rotation of the inner rotor.

20. The device as recited in claim 17 where the outer rotor is adapted to receive torque and the said sealed chamber is adapted to compress gas.

21. The device as recited in claim 17 where the tangential distance between the said first surface faces second surface of the two adjacent fins converge with respects to the traveling radial inward.

22. The device as recited in claim 17 where the tangential distance between the said first surface faces second surface of the two adjacent fins is not constant.

23. A device to convert energy by displacing fluid, the device comprising:

an outer rotor adapted to rotate about a first axis of rotation and comprising a plurality of fins each comprising a first surface and a second surface that partially define a chamber region interposed thereinbetween where a first fin and a second fin are members of the said plurality of fins and are adjacent to each other, and a first reference radius extends through the first fin and a second reference radius extends through the second fin, a first surface of the

said first fin and a second surface of the said second fin, and the number of the chambers indicated by variable □, the outer rotor further comprising an outer reference dimension circle that is concentric with the said first axis of rotation of the said outer rotor and the outer reference dimension circle having a radius r_o;

a plurality of inner rotors adapted to rotate about a set of second axes of rotation where each inner rotor comprises an inner reference circle that is concentric with the second axis of rotation of the inner rotor and intersecting the outer reference circle of the said outer rotor at an intersect point where the velocity of the inner rotor and outer rotor are the same at the said intersect point, the inner reference circle having a radius r_i, the inner rotors further each comprise a plurality of legs the number of said legs is indicated by variable □ where a first leg that is a member of said legs comprises a foot region the foot region comprising;

a radially outward surface;

a heel region comprising a first reference point that is adapted to rotate with the inner reference circle where said first reference point is non constant perpendicular distance from the said first reference radius of the outer reference circle with respects to rotation of the inner and the outer rotor, and the heel region further comprising a first engagement surface adapted to engage the first surface of the said first fin,

a toe region comprising a second reference point that is positioned on said inner reference dimension circle, a second engagement surface that is adapted to engage the second surface of the second fin,

a casing having an inner chamber region that is adapted to house said outer rotor and allow the outer rotor to rotate therein, the casing comprising;

a fluid entrance system comprising a duct to communicate with the chamber region of the said outer rotor,

an interior cavity adapted to house the said inner rotor,

whereas the said variables $\blacksquare$,$\blacksquare$, r_i ,r_o are constrained by the equation $\blacksquare / \blacksquare = r_i / r_o$, the foot region of the said first leg is adapted to engage the chamber region where the first engagement surface of said heel region engages the said first surface of a first fin and the said second engagement surface of the said toe region of the said first foot is adapted to engage the second surface of a second fin to form a sealed operating chamber where rotation of the said first rotor and the said rotor causes displacement of fluid in the sealed operating chamber a finite range of rotation.

24. The device as recited in claim 23 where the said porting of the casing is adapted to allow non compressible fluid to enter the said chamber region and the casing comprising a discharge port in communication with the sealed operating chamber as the volume of fluid is displaced.

25. The device as recited in claim 23 where ratio of r_i / r_o is less than ½.

26. The device as recited in claim 23 where the casing comprises a gas expansion region and a gas inlet port that is in communication with a gas expansion chamber that is defined by first and second surfaces of two adjacent fins and the said first foot where the chamber is adapted to receive expanding gas that applies a torque to the outer rotor.

27. The device as recited in claim 25 where ratio of r_i / r_o is an integer value.

28. The device as recited in claim 26 where ratio of r_i / r_o is less than ½.

29. The device as recited in claim 23 where the casing comprises a gas entrance channel that is adapted to receive a gas and the sealed operating chamber operates as a gas compression chamber that is adapted to compress gas and be discharged through an exit channel.

30. The device as recite in claim 29 where the exit channel has an adjustment system to adjust the compression ratio of the compressed gas.

31. A device to convert energy by displacing fluid, the device comprising:

an inner rotor adapted to rotate about a second axis of rotation where the inner rotor comprises an inner reference circle that is concentric with the second axis of rotation of the inner rotor the inner reference circle

having a radius r_i, the inner rotor further comprise a plurality of legs where a first leg that is a member of said legs comprises a foot region the foot region comprising;

a radially outward surface;

a heel region comprising a first reference point that is positioned on a distance defined as Rip_h from the second axis at a rotational position θh and the heel region further comprising a first engagement surface that is an arc distance r_h from the said first reference point,

a toe region comprising a second reference point that is positioned a distance defined as Rip_t from the said second axis at a rotational position θt, a second engagement surface that is a radius distance r_t from the said second reference point,

an outer rotor adapted to rotate about a first axis of rotation and comprising an outer reference dimension circle that is concentric with the said first axis of rotation of the said outer rotor and the outer reference dimension circle having a radius r_o and the outer rotor comprising;

a first and second fin each comprising a first reference radius at a rotational location θo that extends through the first fin, a first surface of the said first fin a distance defined by gap_h from the said first engagement surface and having orthogonal coordinates Xf_h, Yf_h from

an origin point located on said first reference radius where Xf_h and Yf_h are defined by

$$Xf\_h := (\sin(\theta h)\, Rip\_h - \sin(\theta o)\, Ro)\cos(\theta o) + (-\cos(\theta h)\, Rip\_h - ro + ri + \cos(\theta o)\, Ro)\sin(\theta o) - r\_h - gap\_h$$

$$Yf\_h := (-\cos(\theta h)\, Rip\_h - ro + ri + \cos(\theta o)\, Ro)\cos(\theta o) - (\sin(\theta h)\, Rip\_h - \sin(\theta o)\, Ro)\sin(\theta o)$$

;

a second surface defined by orthogonal coordinates Xf_t and Yf_t from said origin where the distance between the said second surface and the second engagement surface is defined by distance, gap_t where the values Xf_t and Yf_t are defined by

$$Xf\_t := (\sin(\theta t)\, Rip\_t - \sin(\theta o)\, Ro)\cos(\theta o) + (-\cos(\theta t)\, Rip\_t - ro + ri + \cos(\theta o)\, Ro)\sin(\theta o) + r\_t + gap\_t$$

$$Yf\_t := (-\cos(\theta t)\, Rip\_t - ro + ri + \cos(\theta o)\, Ro)\cos(\theta o) - (\sin(\theta t)\, Rip\_t - \sin(\theta o)\, Ro)\sin(\theta o)$$

;

a casing having an inner chamber region that is adapted to house said outer rotor and allow the outer rotor to rotate therein, the casing comprising;

a fluid entrance system comprising a duct to communicate with the chamber region of the said outer rotor,

an interior cavity adapted to house the said inner rotor,

whereas the θo changes at a ratio of r_i / r_o of the θi value and the foot region of the said first leg is adapted to engage the chamber region defined between the said first and second fin where the first engagement surface of said heel region is adapted to engage the said first surface of the first fin and the said second

engagement surface of the said toe region of the said first foot is adapted to engage the second surface of the second fin to form a sealed operating chamber where rotation of the said first rotor and the said rotor causes displacement of fluid in the sealed operating chamber a finite range of rotation.

32. The device as recited in claim 31 where the number of legs of the inner rotor is defined by a variable □ and the number of chambers defined by the plurality of fins is defined by □ where □ ,□, r_i ,r_o are defined by the equation $\square / \square = r_i / r_o$.

33. The device as recited in claim 32 where a plurality of inner rotors are employed and the fluid entrance system further comprises a duct to communicate with the each chamber region of the said outer rotor that rotationally precedes the sealed chamber region of each inner rotor.

34. The device as recited in claim 33 where the sum radial force upon the outer rotor is substantially balanced.

35. The device as recited in claim 33 where the central region of the outer rotor has a drive shaft attached thereto.

36. The device as recited in claim 32 where ratio of r_i / r_o is less than ½.

37. The device as recited in claim 36 where ratio of r_i / r_o is an integer value.